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BULLETIN

OF THE

AMERICAN GEOGRAPHICAL SOCIETY

Vol. XLIV

1912

No. 12

THE CAÑON OF THE URUBAMBA*

BY

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[Map facing p. 896.]

The plateau Indian of Peru believes that evil spirits dwell in the eternal snows of his lofty mountains. His imagination peoples the region of perpetual winter with vindictive and invisible folk who drive him with sickness and pain out of their storm-swept homes. *Siroche*, or mountain sickness, is due to their influence, likewise the vague depression and uneasiness that go with it; yet in curious contrast is their belief in gardens bedecked with flowers on the summits of some of the highest mountains.

On the way to the great cañon of the Urubamba I traveled for several hours in company with a friendly itinerant priest and his Indian attendant. On the farther side of the desert plateau across which we rode rose the snowy crests of the eastern Cordillera of the Andes. At its foot ran a wonderful mile-deep granite cañon, within whose profound depths was the swift Urubamba. The lower course of the river is bordered by tropical forests, a number of sugar plantations, and, still farther down, by the vast territory of the rubber hunters. Through the priest I asked the Indian why he did not live in the warm and pleasant lower portions of the valley at our feet where there were many kinds of food, beautiful flowers, and perpetual spring. At first he gave the usual answer, "Because the savages live there," though his dirty and ragged clothes and his abject face gave me an impression of savagery far deeper than I had ever

*Account of a trip made by the author as Geographer-Geologist of the Yale-Peruvian Expedition of 1911.

received from any forest-dwelling Indian. When pressed for further reasons he at last exclaimed: "Doesn't the stranger know that fever-spirits live in the valley?"

"But," I protested, "you say that there are also bad spirits in the mountains and here you live among them." "Yes," he answered, "but the cold spirits of the *siroche* live only in the small country where the snow lies and at the top of the snow my great ancestors

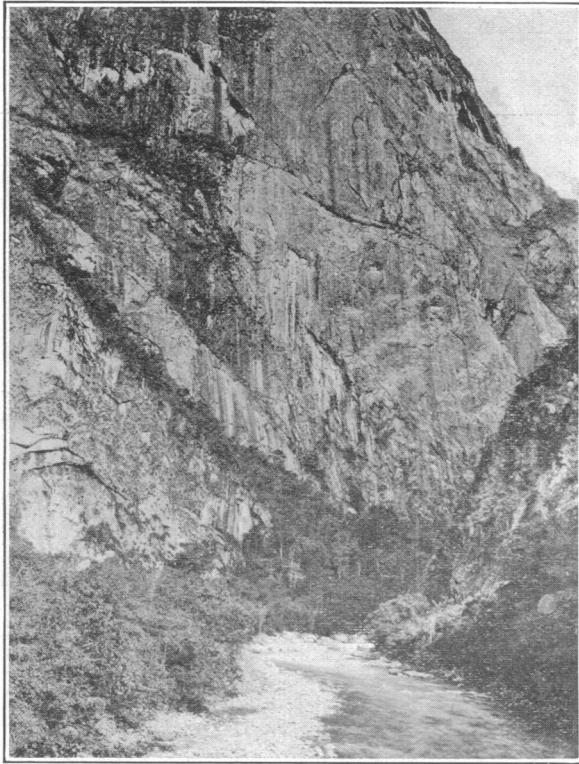


FIG. 1.—The lower half of a two thousand foot cliff, granite gorge of Torontoy, Urubamba valley. At one point the wall rises nearly a mile at an inclination of 10° to 15° from the vertical and is developed entirely along joint planes. It is here that the Urubamba River crosses the granite axis of the Cordillera Vilcapampa, the easternmost system of the Andes of Peru.

once saw flower gardens." With fever-spirits below him in the warm valleys and siroche-spirits in the mountain snows, it is little wonder that the plateau Indian looks upon his bleak home as a paradise on earth. He knows but one more attractive place—the region at the top of the snows just under the sky, where there are

flower gardens without fever-spirits, a region so high that only the mighty men of a legendary age have ever seen it.

We were about to drop over the rim of the cañon. Night had fallen, and it seemed like entering a black abyss until we came to a turn in the steep, stair-like trail where the lights of Urubamba became visible as at the bottom of an enormous bowl. Several hours of half-sliding, half-walking down the steep incline and we were in

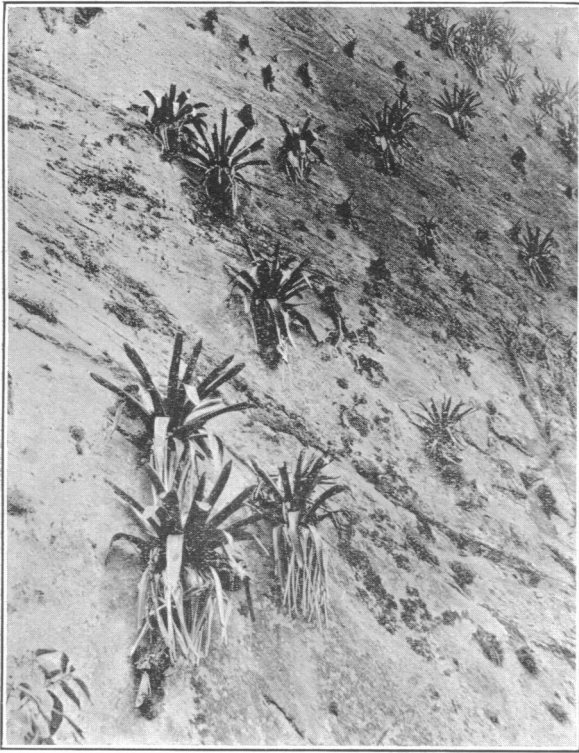


FIG. 2—Cliff vegetation near the bridge of San Miguel, lower end of the granite cañon of Torontoy. The distribution of the vegetation is controlled by the joint cracks where soil and water accumulate. Camera pointed upward 20° from horizontal.

the softer airs of the valley floor. Daylight brought with it an exquisite view. The cold plateau was not even visible, but in the clear morning air the great snow-capped mountains above us seemed to be almost within hand's reach. Light, filmy clouds rode high above them; at their bases were hundreds of torrential brooks fed by the lofty snows. The long alluvial slopes of the valley, intensively culti-

vated, presented rare beauties after the bleak plateau. Bright green alfalfa meadows alternated with fields of ripe barley and wheat. Irrigation ditches lined with trees and shrubs criss-crossed the plain. The villagers exhibited a happier and more prosperous air. Though the temperature had fallen almost to the freezing point during the night, a few hours of sunshine sufficed to warm the air and start the soft up-valley winds. The delights of valley travel had begun.

Our chief object on the valley trip was to study the great cañon of the Urubamba below Rosalina, and to make a topographic and geologic map of it. We wished to know what secrets might here be gathered, what people dwelt along its banks, and if the vague tales of ruined cities at the top of unscalable cliffs had any basis in fact.

Among the unexplored regions of Peru none is more tempting to the geographer than the great region on the eastern border of the Andes, drained by this tributary of the Amazon. It is here that the powerful river, reënforced by hundreds of mountain-born tributaries, finally cuts its defiant way through the last of its great topographic barriers. More than seventy rapids interrupt its course; one of them, at the mouth of the Sirialo, is more than a half mile in extent, and long before one reaches its head he hears its roaring from beyond the forest-clad mountain spurs.

The great bend of the Urubamba in which the line of rapids occurs is one of the most curious hydrographic features in Peru. The river suddenly changes its northward course and striking south of west flows nearly fifty miles toward the axis of the mountains, where, turning almost in a complete circle, it makes a final assault upon the eastern mountain ranges. Fifty miles farther on it breaks through the long serrate chain of the eastern Andes in a splendid gateway more than a half mile deep, the famous *Pongo de Mainique*.

We could gather almost no information as to the nature of the river except from the report of Major Kerbey, an American, who, in 1897, descended the last twenty miles of the one hundred we proposed to navigate. He pronounced the journey more hazardous than Major Powell's famous descent of the Grand Cañon in 1867. He lost his canoe in a treacherous rapid, was deserted by his Indian guides, and only after a painful march through a well-nigh impassable jungle, was he finally able to escape on an abandoned raft. Less than a dozen have ventured down since Major Kerbey's trip was made. A Peruvian mining engineer descended the river a few years ago, and four Italian traders a year later floated down in rafts and canoes, losing almost all of their cargo. For nearly two months they

were marooned upon a sand-bar waiting for the river to subside. At last they succeeded in reaching Mulanquiato, an Indian settlement and plantation owned by Pereira, near the entrance to the cañon. Their attempted passage of the last stretch of rapid resulted in the loss of all their rubber cargo, the work of over a year. Among the half dozen others who have made the journey (Indians and slave traders from down-river rubber posts) there is no record of a single descent without the loss of at least one canoe.

To reach the head of canoe navigation we made a two weeks' muleback journey north of Cuzco through the steep-walled granite cañon of Torontoy, and to the sugar and cacao plantations of the Urubamba at Santa Ana, where we outfitted. At Echarati, thirty miles farther on, where the heat becomes more intense and the first patches of real tropical forest begin, we were obliged to exchange our beasts for ten fresh animals accustomed to forest work and its privations. Three days later we pitched our tent on the river bank at Rosalina, the last outpost of the valley settlements. As we dropped down the steep mountain slope before striking the river flood plain, we passed two half-naked Machiganga Indians perched on the limbs of a tree beside the trail, our first sight of a tribe whose territory we had now entered. Later in the day they crossed the river in a dugout, landed on the sand-bar above us, and gathered brush for the nightly fire, around which they lay wrapped in a single shirt woven from the fiber of the wild cotton.

Rosalina is hardly more than a name on the map and a camp site on the river bank. Some distance back from the left bank of the river is a sugar plantation, whose owner lives in the cooler mountains, a day's journey away; on the right bank is a small clearing planted to sugar cane and yuca, and on the edge of it is a reed hut sheltering three inhabitants, the total population of Rosalina. The owner asked our destination, and to our reply that we would start in a few days for Pongo de Mainique he offered two serious objections. No one thought of arranging so difficult a journey in less than a month, for canoe and Indians were difficult to find, and the river trip was dangerous. Clearly, to start without the loss of precious time would require unusual exertion. Immediately we despatched one Indian messenger to the owner of the small hacienda across the river; one of our peons carried a second note to a man of great influence among the forest Indians, Padre Mendoza, who lives also in the distant mountains.

The answer of Señor Morales was his appearance in person to

offer the hospitality of his home and to assist us in securing canoe and oarsmen. To our note the Padre, from his hill-top, sent a polite answer and the offer of his large canoe if we would but guarantee its return. His temporary illness prevented a visit which we had looked forward to with great interest.

The morning after our arrival I started out on foot in company with our arriero [muleteer] in search of the Machigangas, who fish and hunt along the river bank during the dry season and retire to

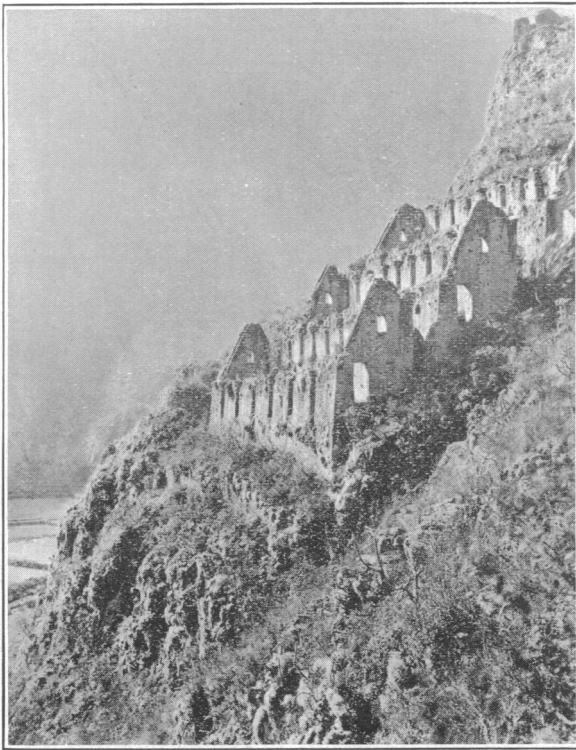


FIG. 3—Portion of the celebrated ruins of Ollantaytambo on steep mountain side east of the town. Irrigated barley fields in lower left-hand corner; temporary snow cover in upper right-hand corner.

their hill camps when the heavy rains begin. We soon left the well-beaten trail, and following a faint woodland path came to the river bank about a half day's journey below Rosalina. There we found a canoe hidden in the overhanging arch of vines, and crossing the river met an Indian family who gave us further directions. Their vague signs were but dimly understood and we soon found ourselves

in the midst of a carrizo [reed] swamp filled with tall bamboo and cane and crossed by a network of interlacing streams. We followed a faint path only to find ourselves climbing the adjacent mountain slopes away from our destination. Once again in the swamp we had literally to cut our way through the thick cane, wade the numberless brooks, and follow wild animal trails, until, late in the day, famished and thirsty, we came upon a little clearing on a sand-bar, the hut of La Sama, who knew the Machigangas and their villages.

After our long day's work we ate the fish and yuca, and drank the limewater prepared for us with a never-to-be-forgotten relish. Late at night La Sama returned from a trip to the Indian villages down river. He brought with him a half dozen Machiganga Indians,

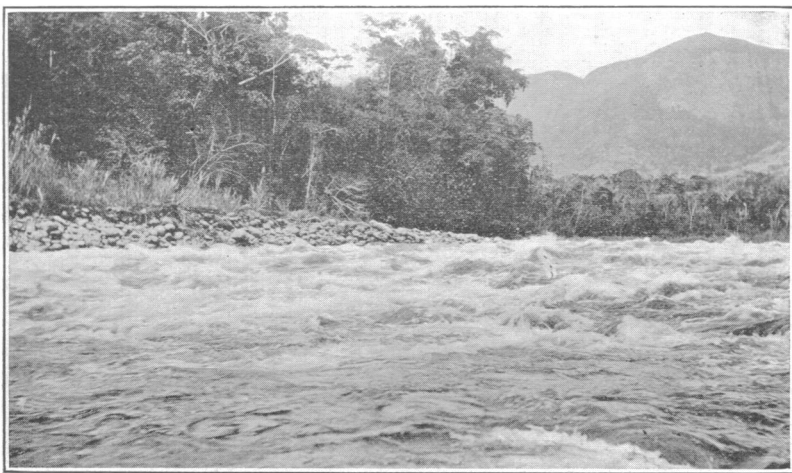


FIG. 4—The Sirialo rapids, Urubamba River, below Rosalina. These are the worst rapids between Rosalina and Pongo de Mainique. They are a half mile long and are filled with boulders brought down by the Sirialo from the distant Cordillera Vilcapampa.

boys and men, and around the camp fire that night gave us a dramatic account of his former trip down river. At one point he leaped to his feet, and, with an imaginary pole shifted the canoe in a swift rapid, turned it aside from imminent wreck and shouting at the top of his voice over the roar of the rapid finally succeeded in evading what had seemed like certain death in a whirlpool. We kept a fire going all night long for we slept upon the ground without a covering, and, strange as it may appear, the cold seemed intense, though the minimum thermometer registered 59° F. The next morning the whole party of ten sunned themselves for nearly an hour until the flies and heat once more drove them to shelter.

Returning to camp next day along a different trail was an experience worth repeating, because of the light it threw on hidden trails known only to the Indian and his friends. Slave raiders in former years devastated the native villages and forced the Indian to conceal his special trails of refuge. At one point we traversed a cliff seventy-five feet above the river, walking on a narrow ledge no wider than one's foot. At another point the dim trail apparently disappeared, but when we had climbed hand over hand up the face of the cliff, hanging to vines and tree roots, we came upon it again. Crossing the river in the canoe we had used the day before, we shortened the return by wading the swift Chirumbia waist-deep, and by crawling along a cliff face for nearly an eighth of a mile. At the steepest point the river had so undercut the face that no passage was afforded, and we swung across some fifteen feet of broken trail on a hanging vine high above the river.

After two days' delay we left Rosalina late in the afternoon of August 7. My party included several Machiganga Indians, La Sama and Dr. W. G. Erving, surgeon of the expedition. At the first rapid we learned the methods of our Indian boatmen. It was to run the heavy boat head on into shallow water at one side of a rapid and in this way "brake" it down stream. Heavily loaded with six men, 200 pounds of baggage, a dog, and supplies of yuca and sugar cane, our canoe was as rigid as a steamer, and we dropped safely down rapid after rapid until long after dark, and by the light of a glorious tropical moon, we beached our craft in front of La Sama's hut at the edge of the cane swamp.

Here for five days we endured a most exasperating delay. La Sama had promised Indian boatmen and now said that none had yet been secured. Each day Indians were about to arrive, but by night-fall the promise was broken only to be repeated the following morning. To save our food supply—we had taken but six days' provisions—we ate yuca soup and fish and some parched corn, adding to this only a little from our limited stores. At last we could wait no longer, even if the map had to be sacrificed to the work of navigating the canoe. Our determination to leave stirred La Sama to final action. He secured a half-breed assistant and embarked with us, planning to get Indians farther down river or make the journey himself.

On August 12, at 4:30 P.M., we entered upon the second stage of the journey. As we shot down the first long rapid and rounded a wooded bend the view down river opened up and gave us our first

clear notion of the region we had set out to explore. From mountain summits in the clouds long trailing spurs descend to the river bank. In general the slopes are soft-contoured and forest-clad from summit to base; only in a few places do high cliffs diversify the scenery. The river vista everywhere includes a rapid and small patches of "playa" or scraps of flood plain on the inside of the river curves. Although a true cañon hems in the river at two celebrated passes farther down, the upper part of the river flows in a somewhat open valley of moderate relief.

A light shower came up at sunset, a typical late afternoon down-pour so characteristic of the tropics. We landed at a small encampment of Machigangas, built a fire against the scarred trunk of a great palm, and made up our beds in the open, covering them with our rubber ponchos. Our Indian neighbors gave us yuca and corn, but their neighborliness went no further, for when our boatmen attempted to sleep under their roofs they drove them out and fastened as securely as possible the shaky door of their hut.

All our efforts to secure Indians, both here and elsewhere, proved fruitless. One excuse after another was overcome; they plainly coveted the trinkets, knives, machetes, muskets, and ammunition that we offered them; and they appeared to be friendly enough. Only after repeated assurances of our friendship could we learn the real reason for their refusal. Some of them were escaped rubber pickers that had been captured by white raiders several years before, and a return to the rubber country meant enslavement, heavy floggings, and separation from their numerous wives. The recollection of their hardships, their final escape, the cruelty of the rubber men, and the difficult passage of the rapids below were a set of circumstances that nothing in our list of gifts could overcome. My first request a week before had so sharpened their memory that one of them related the story of his wrongs, a recital intensely dramatic to the whole circle of his listeners, including myself. Though I did not understand the details of his story, his tones and gesticulations were so effective as to hold me as well as his kinsmen of the woods spellbound for over an hour.

It is appalling to what extent this great region has been depopulated by the slave raiders and those arch enemies of the savage, smallpox and malaria. Over sixty Indians died of malaria in one year at Rosalina; and only twenty years ago seventy of them, the entire population of the Pongo, were swept away by smallpox. For a week we passed former camps near small abandoned clearings,

once the home of little groups of Machigangas. Even the summer shelter huts on the sand-bars, where the Indians formerly gathered from their hill homes to fish, are now almost entirely abandoned. Though our men carefully reconnoitred each one for fear of ambush, the precaution was needless. Below the Coribeni the Urubamba is a great silent valley. It is fitted by Nature to support numerous villages, but its vast solitudes are unbroken except at night, when a few families that live in the hills slip down to the river to gather yuca and cane.

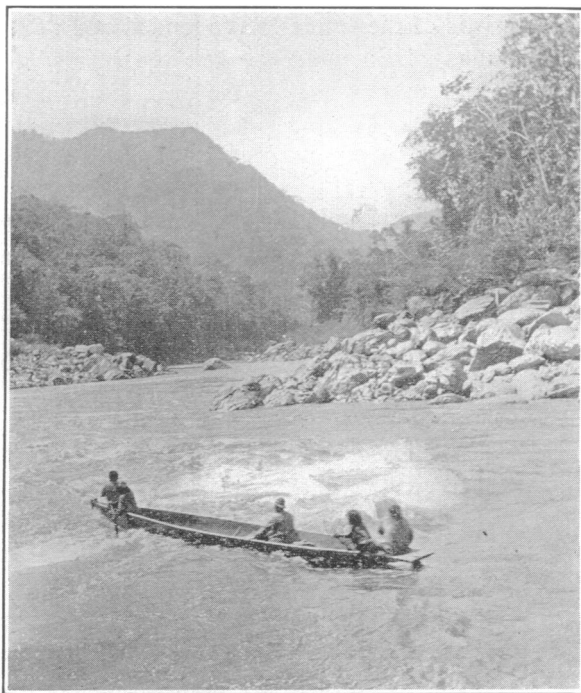


FIG. 5—Machiganga Indians taking a twenty-five foot canoe through one of the smaller rapids above the "Pongo" or gateway on the eastern border of the Andes. A speed of twenty miles an hour is attained in the swiftest rapids.

By noon of the second day's journey we reached the head of the great rapid at the mouth of the Sirialo. We had already run the great Coribeni rapid, visited the Indian huts at the junction of the big Coribeni tributary, exchanged our canoe for a larger and steadier one, and were now to negotiate one of the ugliest rapids of the upper river. The rapid is formed by the gravel masses that the Sirialo

brings down from the distant Cordillera Vilcapampa. They trail along for at least a half mile, split the river into two main currents and half choke the mouth of the tributary. For nearly a mile above this great barrier the main river is ponded and almost as quiet as a lake.

We let our craft down this rapid by ropes, and in the last difficult passage were so badly handled by our almost unmanageable canoe as to suffer from several bad accidents. All of the party were injured in one way or another, while I suffered a fracture sprain that made painful work of the rest of the river trip.

At two points along the Urubamba below Rosalina the river is shut in by steep mountain slopes and vertical cliffs. Canoe-naviga-

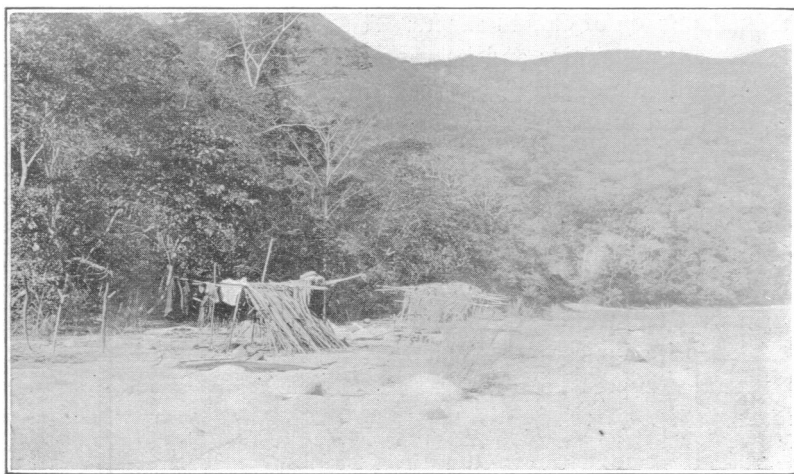


FIG. 6—A temporary shelter hut on a sand-bar near the great bend of the Urubamba (see map).
The Machiganga Indians use these cane shelters during the fishing season, when the river is low.

tion below the great Sirialo and Coribeni rapids is no more hazardous than on the rapids of our northern rivers, except at the two “pongos” or narrow passages. The first occurs at the sharpest point of the abrupt curve shown on the map; the second is the celebrated Pongo de Mainique. In these narrow passages in time of high water there is no landing for long stretches. The bow paddler stands well forward and tries for depth and current; the stern paddler keeps the canoe steady in its course. When paddlers are in agreement even a heavy canoe such as ours can be generally directed into the most favorable channels. Our canoemen were always in disagreement,

however, and as often as not we shot down rapids at a speed of twenty miles an hour, broadside on, with an occasional bump on projecting rocks or boulders whose warning ordinary boatmen would not let go unheeded.

The scenery at the great bend is indescribably beautiful. The tropical forest crowds the river bank, great cliffs rise sheer from the water's edge, their faces overhung with a trailing drapery of vines, and in the longer river vistas one may sometimes see the distant heights of the Cordillera Vilcapampa. We shot the long succession of rapids in the first cañon without mishap, and at night pitched our tent on the edge of the river near the mouth of the Manugali.

From the sharp peak opposite our camp we saw for the first time the phenomenon of cloud-banners. A soft breeze was blowing from the western mountains and its vapor was condensed into clouds on the leeward side of the peak. The clouds were being carried down the wind and dissolved, but were constantly forming afresh at the summit. In the night a thunderstorm arose and swept with a roar through the vast forest above us. The solid canopy of the tropical forest fairly resounded with the impact of the heavy raindrops. The next morning all the brooks from the farther side of the river were in flood and the river discolored. The last mist wraiths of the storm were still trailing through the tree-tops and wrapped about the peak opposite our camp, only parting now and then, giving us most delightful glimpses of a forest-clad summit riding high above the clouds.

The alternation of deeps and shallows at this point in the river and the well-developed cañon meanders are among the most celebrated of their kind in the world. Though shut in by high cliffs and bordered by mountains the river exhibits a succession of curves so regular that one might almost imagine the country a plain from the pattern of the meanders. The succession of smooth curves for a long distance across existing mountains points to a time when a lowland plain with moderate slopes was developed here, a plain drained by strongly meandering rivers. Uplift afforded a chance for renewed down-cutting on the part of all the streams, and the incision of the meanders. The present meanders are, of course, not the identical ones that were formed on the lowland plain; they are rather their descendants. Though they still retain their strongly curved quality, and in places have almost cut through the narrow spurs between meander loops, they are not smooth like the meanders of the Missis-

sippi. Here and there are sharp irregular turns that mar the symmetry of the larger curves. The alternating bands of hard and soft rock have had a large part in making the course more irregular. The meanders have responded to the rock structure. Though regular in their broader features they are irregular and deformed in detail.

Deepes and shallows are known in every vigorous river, but it is seldom that they are so prominently developed as in these great cañons. At one point in the upper cañon the river has been broadened into a lake two or three times the average width of the channel and with a scarcely perceptible current; above and below the "laguna," as the boatmen call it, are big rapids with beds so shallow that rocks project in many places. In the Pongo de Mainique the river is at one place only fifty feet wide, yet so deep that the current is almost stagnant. It is in such places that the red forest deer grazes under leafy arcades. Here, too, are the great boa constrictor trails several feet wide and bare like a roadway. At night the great serpents come trailing down to the river's edge, where the red deer and the wildcat, or so-called "tiger," are their easy prey.

It is in such quiet stretches that one finds also the vast colonies of water skippers. They dance continuously in the sun with an incessant darting motion from right to left and back again. Occasionally one dances about in circles, then suddenly darts through the entire mass, though without colliding against his equally erratic neighbors. An up-and-down motion still further complicates the effect. It is positively bewildering to look intently at the whirling, darting multitude and try to follow their complicated motions. Every slight breath of wind brings a shock to the organization of the dance. For though they dance only in the sun, their favorite places are the sunny spots in the shade near the bank as beneath an overhanging tree. When the wind shakes the foliage the mottled pattern of shade and sunlight is confused, the dance slows down, and the dancers become bewildered. In a storm they seek shelter in the jungle. The hot, quiet, sunlit days bring out literally millions of these tiny creatures.

One of the longest deeps in the whole Urubamba lies just above the Pongo at Mulanquiato. We drifted down with a gentle current just after sunset. Strange shrill whistles sounded from either bank, the piercing notes of the lowland cicada, *cicada tibicen*. Long decorated canoes, better than any we had yet seen, were drawn up in the quiet coves. Soon we came upon the first settlement. The owner, Señor Pereira, has gathered about him a group of Machigangas, and by marrying into the tribe has attained a position of great influence

among the Indians. Upon our arrival a gun was fired to announce to his people that strangers had come, upon which the Machigangas strolled along in twos and threes from their huts, helped us ashore with the baggage, and prepared the evening meal. Here we sat down with five Italians, who had ventured into the rubber fields with golden ideas as to profits. After having lost the larger part of their merchandise, chiefly cinchona, in the rapids the year before, they had established themselves here with the idea of picking rubber. Without capital, they followed the ways of the itinerant rubber picker and had gathered "caucho," the poorer of the two kinds of rubber. No capital is required, the picker simply cuts down the likeliest trees, gathers the coagulated sap, and floats it down-stream to market.

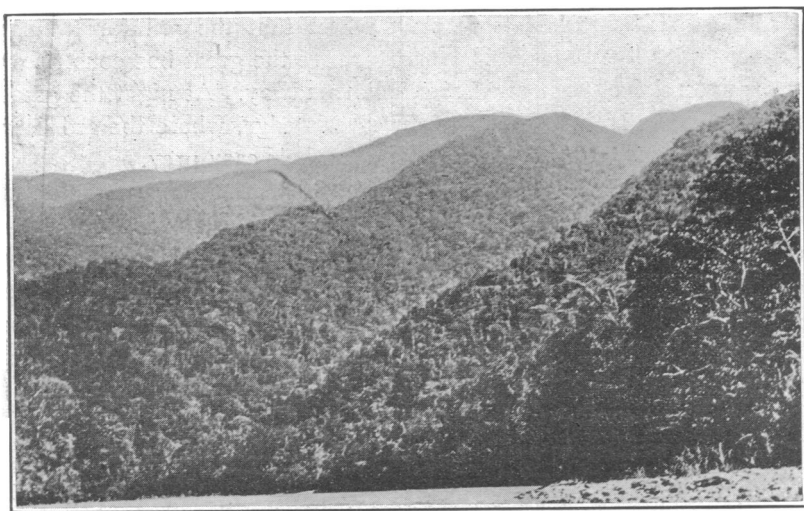


FIG. 7.—General or landscape view in the Urubamba at the foot of the Sirialo rapids.

After a year of this life they had grown restless and were venturing on other schemes for the great down-river rubber country.

A few weeks later, on returning through the forest, we met their carriers with a few small bundles, the only part of their cargo they had saved from the river. Without a canoe or the means to buy one they had built rafts, which were quickly torn to pieces in the rapids. We, too, should have said "*pobres Italianos*" if their venture had not been so plainly foolish. The rubber territory is difficult enough for men with capital; for men without capital it is impossible. Such men either become affiliated with organized companies before long or get out of the region when they can. A few, made desperate by

risks and losses, cheat and steal their way to rubber. Two years before our trip an Italian had murdered two Frenchmen just below the Pongo and stolen their rubber cargo, whereupon he was shot by Machigangas under the leadership of Domingo, the chief who was with us for a part of the time. Afterward they brought his skull to the top of a pass along the forest trail and set it up on a cliff at the very edge of Machiganga-land as a warning to others of his kind.

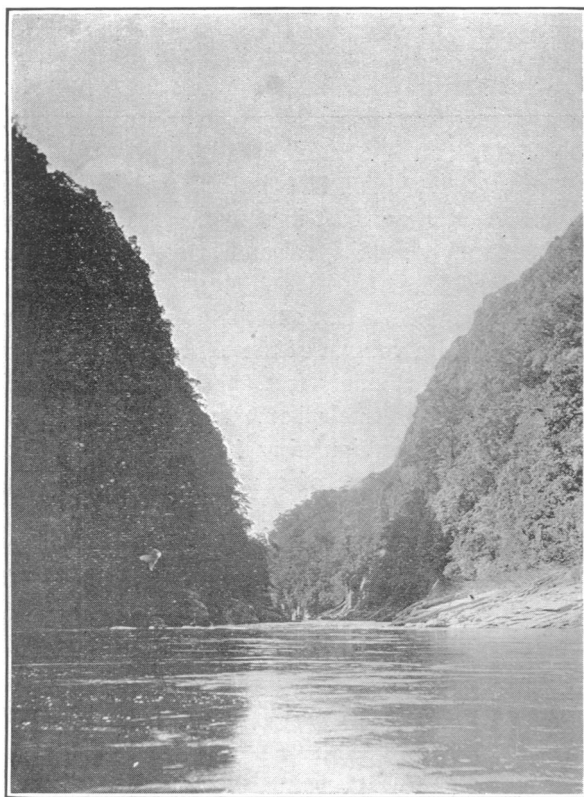


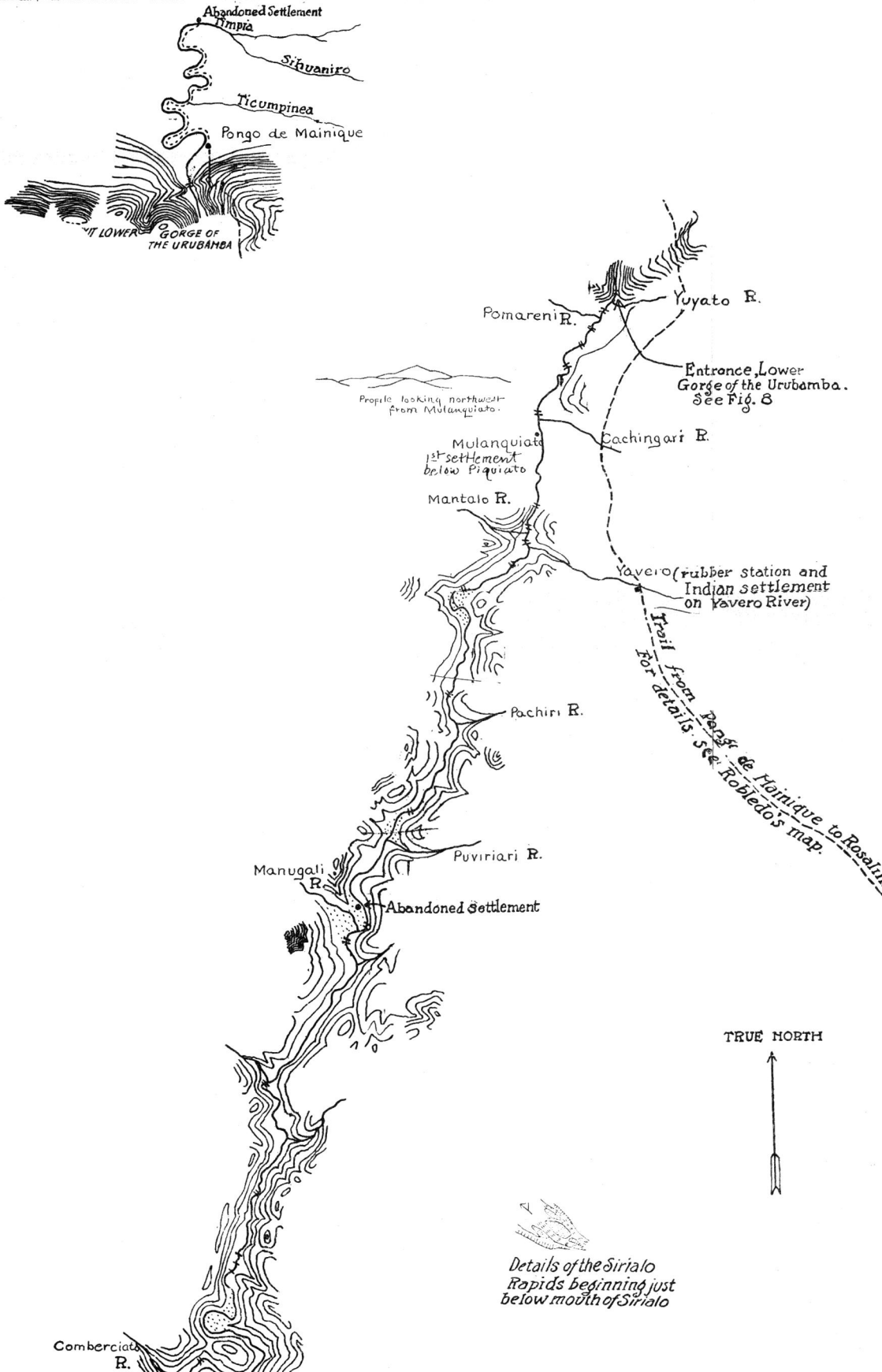
FIG. 8--The upper entrance to the Pongo de Mainique, where the Urubamba crosses the last range of the Andes in a splendid gateway 4,000 feet deep. The river is broken by an almost continuous line of rapids in one of which Major Kerbey lost his entire outfit in 1897.

At Mulanquiato we secured five Machigangas and a boy interpreter, and on August 17 made the last and most difficult portion of our journey. We found the Indians much more skillful and daring than our earlier boatmen. Well-trained, alert, powerful, and with excellent team-play, they swept the canoe into this or that thread of

the current, and took one after another of the rapids with the greatest confidence. No sooner had we passed the Sintulini rapids, fully a mile long, when we reached the mouth of the Pomareni. This swift tributary comes in almost at right angles to the main river and gives rise to a confusing mass of standing waves and conflicting currents rendered still more difficult by the whirlpool just below the junction. So swift is the circling current of the *mælstrom* that the water is hollowed out like a great bowl, a really formidable point and one of our most dangerous passages; a little too far to the right and we should be thrown over against the cliff-face; a little too far to the left and we should be caught in the whirlpool.' Once in the swift current the canoe became as helpless as a chip. It was turned this way and that, each turn heading it apparently straight for destruction. But the Indians had judged their position well, and though we seemed each moment in a worse predicament, we at last skimmed the edge of the whirlpool and brought our canoe to shore just beyond its rim.

A little farther on and we came to the great upper gateway of the Pongo, where the entire volume of the big river flows between cliffs at one point no more than fifty feet apart. Here are concentrated the worst rapids of the lower Urubamba. For nearly fifteen miles the river is an unbroken succession of rapids, and once within its walls the Pongo offers small chance of escape. At some points we were fortunate enough to secure a foothold along the edge of the river and to let our canoe down by ropes. At others we were obliged to take chances with the current, though the great depth of water in most of the Pongo rapids makes them really less formidable in some respects than the shallow rapids up stream. The chief danger here lies in the rotary motion of the water at the sharpest bends. The effect at some places is extraordinary. A floating object is carried across stream like a feather and driven at express-train speed against a solid cliff. In trying to avoid one of these cross-currents our canoe became turned midstream, we were thrown this way and that, and three standing waves broke over us and half filled the canoe.

Below the worst rapids the Pongo exhibits a swift succession of natural wonders. Fern-clad cliffs border it, a bush resembling the juniper reaches its dainty finger-like stems far out over the river, and the banks are heavily clad with mosses. The great woods, silent, impenetrable, mantle the high slopes and stretch up to the limits of vision. Cascades tumble from the cliff summits or go rippling down the long inclines of the slate beds set almost on edge. Finally



ROUGH SKETCH CONTOUR MAP of the URUBAMBA VALLEY BETWEEN ROSALINA and PONGO DE MAINIQUE by Isaiah Bowman

Scale: 1 inch = 4 miles.

Contour interval approximately 200 feet.

— rapids

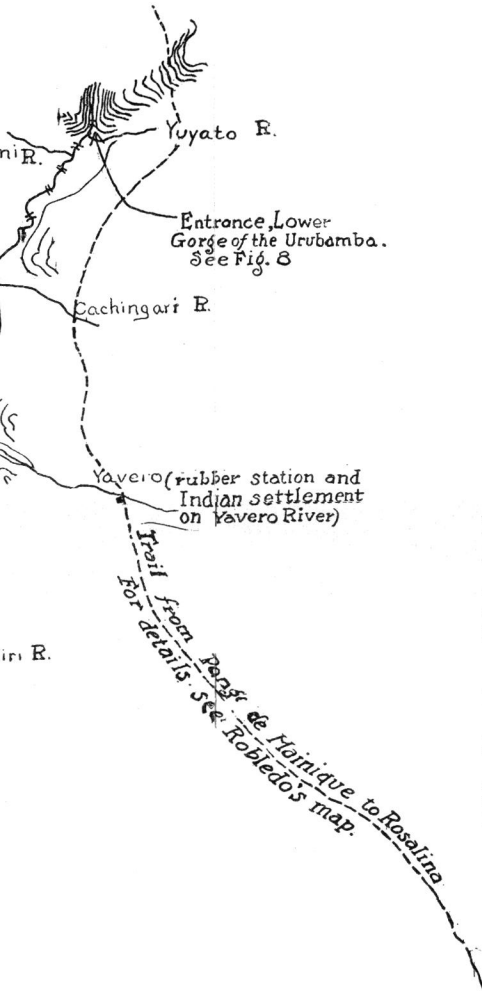
alluvial flats, locally called playas

Elevation of Rosalina: 2,000 feet

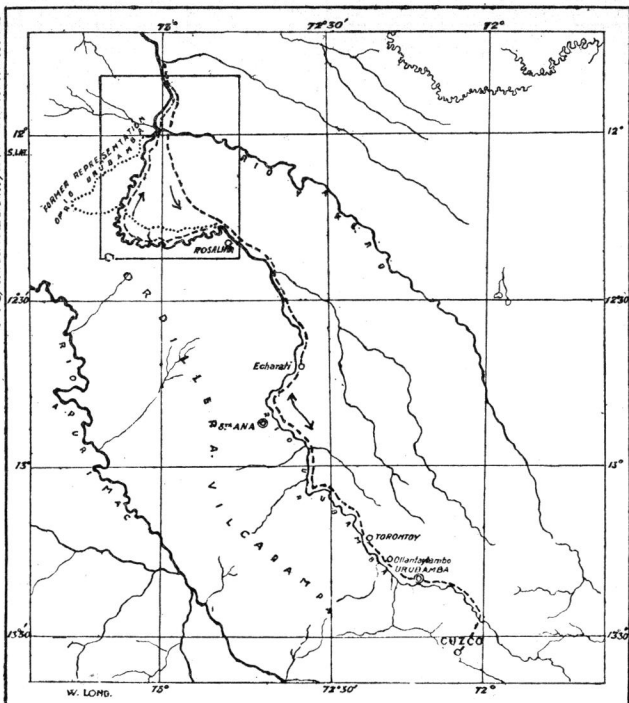
" " Pongo de Mainique: 1,200 feet.

" " Passes on trail between Rosalina and
Pongo de Mainique: 5,000-7,000 feet

Only the lower slopes of the long mountain spurs can be seen from the river; hence only in a few places could observations be made on the topography of distant ranges. For details of trail from Rosalina to Pongo de Mainique via Yavero see "Plano de las Secciones y Afluentes del Río Urubamba: 1902-1904", scale 1:150,000, by Luis M. Robledo in Bol. Soc. Geogr. Lima, Año XIV, Tomo XV, Trim. Cuarto.



Note: Following the last map the course of the Apurimac is incorrectly shown. The Apurimac and Cachingari tributaries are nearly in the same line, and were so shown in the original map. The Apurimac is shown in the present map with the necessary corrections.



SKETCH MAP SHOWING THE ROUTE OF THE YALE-PERUVIAN EXPEDITION OF 1911 DOWN THE URUBAMBA VALLEY, TOGETHER WITH THE AREA OF THE MAIN MAP AND THE CHANGES IN THE DELINEATION OF THE BEND OF THE URUBAMBA RESULTING FROM THE SURVEYS OF THE EXPEDITION. BASED ON THE MAPA QUE COMPRENDE LAS ULTIMAS EXPLORACIONES Y ESTUDIOS VERIFICADOS DESDE 1900 HASTA 1906, 1:1,000,000, BOL. SOC. GEOGR. LIMA, AÑO XIX TOMO XXV, TRIM. PRIMERO. Route thus:-----

...ls of the Sirialo
...ds beginning just
...mouth of Sirialo

Chapo Grande R.

People looking northwest
from Mulanquiato.

Gorge of the Urubamba.
See Fig. 8

Mulanquiato
1st settlement
below Piquiato

Cachingari R.

Mantalo R.

Yavero (rubber station and
Indian settlement
on Yavero River)

Pachiri R.

Puviriari R.

Manugali R.

Abandoned Settlement

Trail from Pagar de Moirique to Rosalia
for details see Robledo's map.

TRUE NORTH



Details of the Sirialo
Rapids beginning just
below mouth of Sirialo

Comercial R.

Sangobatea R.

Purvatani R.

PIQUIATO
(few people)

Savarusiato
(abandoned)

Cosireni R.

Quitani R.

Coribeni R.
Said to rise in
Cordillera Vilca

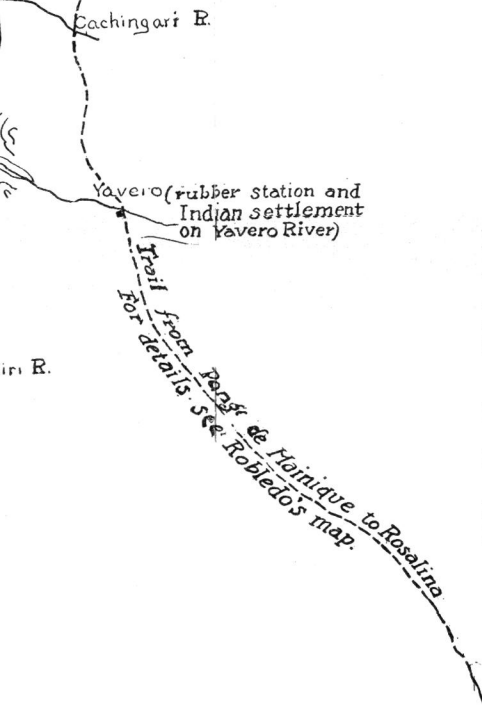
Sirialo R.
Said to rise
in Cordillera Vilcapampa

Maturiato R.

Gorge of the Urubamba.
See Fig. 8

Pongo de Mainique: 5,000-7,000 feet

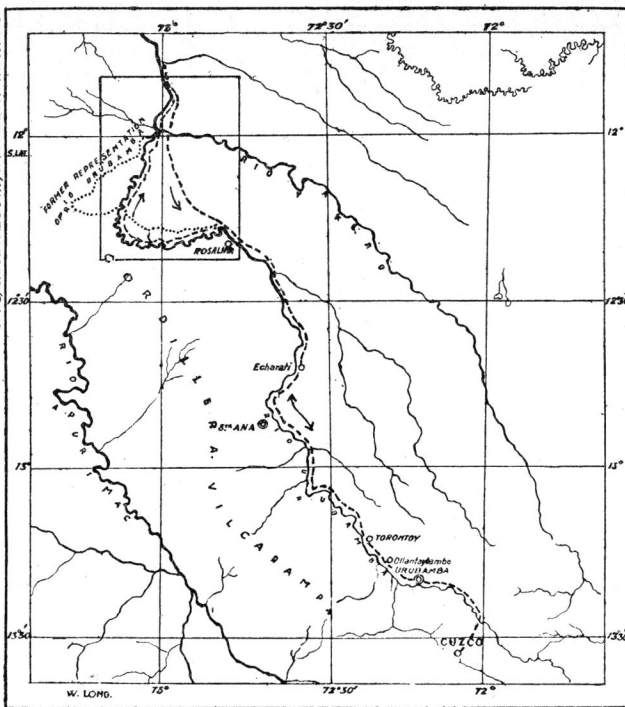
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TRUE NORTH



Note: Following the last map the course of the Apurimac is incorrectly shown. The Yavero and Cachingari tributaries rise nearly in the same line, and the course of the Apurimac is shown in the correct line and not the old line.

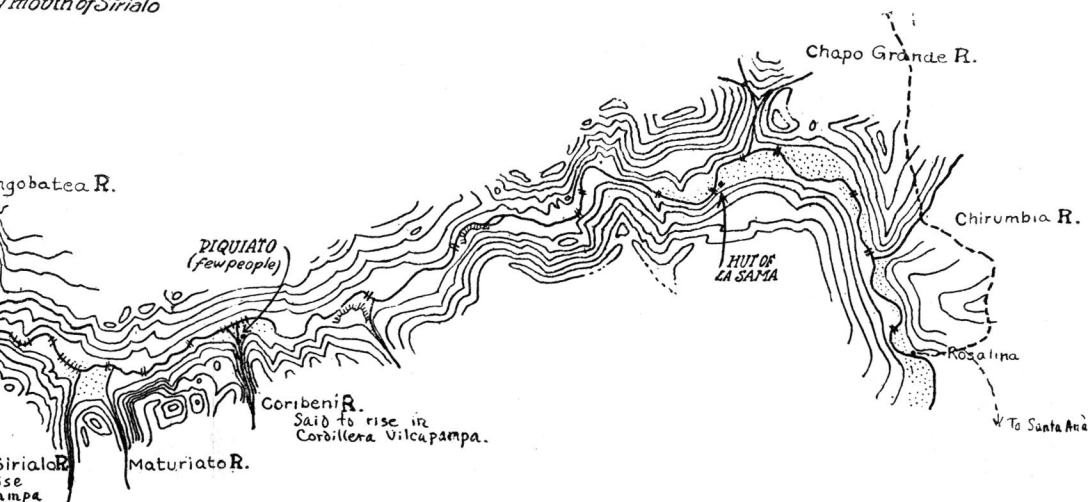


SKETCH MAP SHOWING THE ROUTE OF THE YALE-PERUVIAN EXPEDITION OF 1911 DOWN THE URUBAMBA VALLEY, TOGETHER WITH THE AREA OF THE MAIN MAP AND THE CHANGES IN THE DELINEATION OF THE BEND OF THE URUBAMBA RESULTING FROM THE SURVEYS OF THE EXPEDITION. BASED ON THE MAPA QUE COMPRENDE LAS ULTIMAS EXPLORACIONES Y ESTUDIOS VERIFICADOS DESDE 1900 HASTA 1906, 1:1,000,000, BOL. SOC. GEOGR. LIMA, AÑO XIX TOMO XXV, TRIM. PRIMERO. Route thus: ----

Is of the Sirialo
ds beginning just
mouth of Sirialo

ngobatea R.

Sirialo R.
se
ampa



appear the white pinnacles of limestone that hem in the narrow lower entrance or outlet of the Pongo. Beyond this passage one comes suddenly out upon the edge of a rolling forest-clad region, the great rubber territory, the country of the great woods.

From the summits of the white cliffs 4,000 feet above the river we were in a few days to have one of the most extensive views in South America. The break between the Andean Cordillera and the hill-dotted plains of the lower Urubamba valley is almost as sharp as a shoreline. The rolling plains are covered with leagues upon leagues of dense, shadowy, fever-haunted jungle. The great river winds through in a series of splendid meanders, and with so broad a channel as to make it visible almost to the horizon. Down river from our lookout one can reach ocean steamers at Iquitos with less than two weeks of travel. It is three weeks to the Pacific *via* Cuzco and more than a month if one takes the route across the high bleak lava-covered country which we were soon to cross on our way to the coast at Camaná.

SURVEY OF THE SIACHEN GLACIER

BY

FANNY BULLOCK WORKMAN
Officier de l'Instruction Publique, France

As reported in 1911 in geographical periodicals, Dr. W. Hunter Workman and I, after completing our exploration in the Karakoram Mountains among the Hushe glaciers and those of the Kondus system, crossed to the Saltoro valley and traversed the Bilafond La [Pass] (18,400 feet) to the Siachen* or Rose Glacier on August 19th. We examined it for some distance above the entrance of the Bilafond branch, and visited two of its most important affluents, but it was too late in the season to consider the survey of a glacier the most noteworthy points of which lie at altitudes above 17,000 feet.

The object of the 1912 expedition was to make as detailed a map as possible of the whole glacier and to ascend to and examine its apparently somewhat complex sources, and elucidate, if possible, the problem of their relations to regions beyond. Mr. C. Grant Peterkin, who had received the diploma of the Royal Geographical Society

* The largest valley glacier yet known in Asia. Probably fifty miles or more in length.